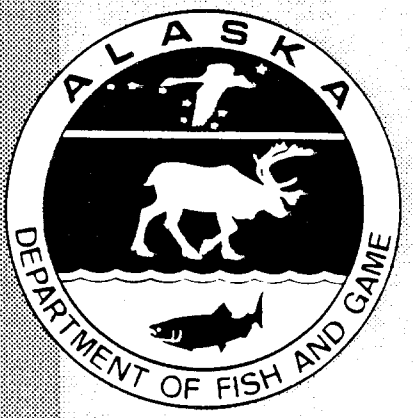
HAWK INLET SHORELINE PURSE SEINE FISHERY, 1989



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HAWK INLET SHORE PURSE SEINE FISHERY, 1989

By

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ABSTRACT

During July of 1989, salmon purse seining was conducted along the Hawk Inlet Shore north of Point Marsden in Chatham Strait. No seining had occurred in the area since 1983 due to a regulatory closure by the Alaska Board of Fisheries. The need for a fishery in 1989 was based on the expected harvestable surplus of Taku River pink salmon. The area was opened on July 9, 16, and 17 and resulted in a total catch of 179 chinooks, 15,032 sockeyes, 1,258 cohos, 671,590 pinks and 19,186 chums. Catch sampling of pink salmon showed no length characteristics which could be used to identify the proportion of Taku River stocks that were harvested in the fishery. A qualitative sockeye scale analysis revealed an overall composition of approximately 43% Upper Lynn Canal stocks with the remaining 57% being composed of other sockeye stocks in Districts 11, 12, and 15. A portion of the coho harvested by this fishery would otherwise have migrated through the Juneau area contributing to the sport fishery, however catches of coho in Districts 12 and 14 were much larger historically than the 1989 catch.

INTRODUCTION

The western shore of Admiralty Island between Point Marsden and Funter Bay is known as the Hawk Inlet Shore. A portion of all stocks of salmon returning to their natal streams in Lynn Canal, Stephens Passage, Seymour Canal, Frederick Sound, Chatham Strait, and Peril Strait pass through this area as they decide whether to go north or south after they have entered from the ocean through Icy Straits. The Hawk Inlet Shore has always been a very productive fishing area, first being exploited by floating fish traps and, in recent times, by the purse seine fishery (the area was not fished between 1973 and 1978 due to poor pink salmon returns). The return of seine gear to the shore in 1979 raised allocation concerns from drift gill net fishermen in Lynn Canal and Stephens Passage and has been an issue before the Alaska Board of Fisheries on several occasions in recent years.

During the 1988-89 meeting of the Alaska Board of Fisheries, a regulation was adopted that reopened the Hawk Inlet Shore north of Point Marsden during the month of July. The area had been closed during July by regulation since 1984. The opening would be dependent upon the abundance of early run pink salmon entering the Juneau area. The conservation of all stocks was to be considered before the area was opened, and a maximum harvest of 15,000 sockeye was set for the fishery during July. Good abundances of pink salmon developed during the 1989 season and the area was opened for two fishing periods, totaling three days, in July.

This report summarizes the events leading up to the 1989 purse seine fishery north of Point Marsden, reviews the information available during the season that determined the openings, and summarizes the catches. A brief analysis on the impacts of this fishery on the Juneau area hatchery returns and local coho salmon stocks is also presented.

BRIEF HISTORY OF HAWK INLET SHORE FISHERY

Many fish traps were located in Icy Straits and Chatham Straits prior to Alaska statehood in 1959. The five floating traps which operated between Hawk Inlet and Funter Bay were very productive. Following statehood, fish traps were banned and purse seine gear was utilized to harvest the pink salmon returns. During the 1960s the seine season started in outer Icy Straits in early July and, as the season progressed, the fishing fleet dispersed to the inside and southern districts. The early season fishery was composed of many different pink salmon stocks. Early runs in Seymour Canal and Frederick Sound began to experience poor returns in the late 1960s and early 1970s due to overharvesting weak returns in this mixed stock fishery. By the time weaknesses in the early run areas was detected in-season, needed escapement had already been harvested by the Icy Strait fishery. Commercial fisheries management of pink salmon changed during the mid 1970s into more discrete stock unit management, whereby the early

runs were allowed to enter the inside areas in order to assess their strength and determine appropriate harvest levels. This management approach continues today with seining in Icy Strait limited to areas that target on local stocks such as Port Althorp, Idaho Inlet, Port Frederick, and the Whitestone Shoreline. Early season stock units that are managed separately are Tenakee Inlet, Peril Strait, Frederick Sound and Seymour Canal. In both Icy Strait and northern Chatham Strait, purse seining is delayed until indications of abundance are determined for the inside areas. The Hawk Inlet Shore area north of Point Marsden is opened when northern inside stocks have harvestable surpluses. Northern inside stocks consist of pinks returning to streams in Lynn Canal and upper Stephens Passage. The area south of Point Marsden is managed to harvest pink salmon surpluses of southbound fish, and local Chatham Strait stocks. Tables 1 and 2 show the historical harvest of all salmon since 1960 in Icy Strait, District 14, and Chatham Strait, District 12. Table 3 shows the historical harvest in the Hawk Inlet Shore, Subarea 112-16, and Table 4 shows the historical catch along the Whitestone Shore, Subarea 114-27.

RECENT ALASKA BOARD OF FISHERIES ACTIONS

During the fall of 1983, the Board of Fisheries considered a proposal to create an experimental pink salmon fishery in the District 11 Taku Inlet gill net area to utilize a harvestable surplus of pink salmon returning to the Taku River. The Taku River pink salmon stock was only a small stock until recently. Village Falls on the Nakina River, a Canadian tributary of the Taku River, was blasted out in 1977 to improve king salmon passage over this partial barrier. This stream enhancement opened several miles of additional spawning area to pink salmon. Pink salmon returns to the Taku River increased dramatically as evidenced by harvests and counts at the Nakina Weir and at the Canyon Island fish wheel site. The odd year return to the Taku River in recent years has exceeded the escapement goal range of 250,000 to 300,000 fish established by the U.S./Canada Treaty. The 1985 and 1987 escapements were estimated by mark recapture techniques to be approximately 1,000,000 and 700,000, respectively.

The proposal to create a special pink salmon gill net fishery was adopted by the board and an experimental 5 inch maximum mesh size gill net fishery was established beginning with the 1984 season. At this same meeting a regulation was adopted whereby purse seining could not occur north of Point Marsden until August 1. Prior to this time, management was under no regulatory limitation in determining when to open the Hawk Inlet Shore to salmon purse seining. The area was usually open in late July (Table 5). Fishing periods depended on pink salmon abundance. An unwritten policy was in affect beginning in the early 1980s whereby the northern boundary of the purse seine fishery in the area was at the latitude of Hanus Reef Light. This policy was the result of direction given to the department by the Alaska Board of Fisheries after discussions about allocation between drift gill net and purse seine fisheries. Table 5 shows the opening dates and northern boundaries of the Hawk Inlet Shore area since 1967.

After conducting the experimental gill net fishery in 1984 and 1985, department staff presented the results to the Board of Fisheries in 1985. More pink salmon were caught per boat during the special fishery, but the pink harvest was smaller than during the regular sockeye fishery opening due to low participation. Sockeye catches per boat were also very high in the special five inch maximum mesh size fishery. It was concluded that the additional fishing time to harvest pink salmon with small mesh gill nets would overharvest sockeye if the normal sockeye fishing periods were also maintained. Changing the fishery to target on pink salmon would not be practical since it would probably result in drop outs of the larger more valuable sockeye. The experimental 5 inch maximum mesh size fishery was not continued after 1985.

During the fall of 1988 the Board of Fisheries was again faced with public proposals for regulatory change dealing with the utilization of Taku River pink salmon. Gill net fisherman proposed another special pink salmon fishery with a maximum mesh size of 4 3/4 inches. Purse seine fisherman proposed a seine fishery north of Point Marsden during July. With the experience of the 1984 and 1985 experimental gill net fishery, the Board provided the staff the option in 1989 to open the Hawk Inlet Shore north of Point Marsden to purse seining during July to improve utilization of Taku River pink salmon. The opening would be dependent upon an early assessment of the run and the general abundance of pink salmon in the Hawk Inlet Shore area. Indicators of abundance would be the District 11 drift gill net fishery, the Taku River fish wheel catches, test fishing along the Hawk Inlet Shore, and aerial observations of abundance throughout the Juneau area. Conservation of all species was to be considered prior to opening the Hawk Inlet Shore, and a maximum harvest of 15,000 sockeye was established for the area during July. The results of the new fishery would be evaluated by the board during their winter 1990 meeting.

1989 HAWK INLET SHORE MANAGEMENT

Prior to the 1989 summer season both drift gill net and purse seine fishermen were very interested in how the department was going to manage the July Hawk Inlet Shore fishery. Drift net fisherman were concerned that overharvest of weak sockeye and chum returns to Port Snettisham would occur. The impact of a Hawk Inlet Shore opening on expected poor returns would be weighed by the managers against the magnitude of the pink salmon surplus. Both gear groups were also very concerned about how the department would manage for the 15,000 sockeye limit. Gill net fisherman feared misreporting of the sockeye catch would occur, and seiners feared that the department would overreact to that concern. To insure accurate reporting of the catch, mandatory delivery prior to leaving the area was considered, but it was determined the department did not have that authority. Instead, a heavy monitoring effort was planned during the fishery to determine the composition of sockeye in the catch and document each boat that participated in the fishery.

A test fishery was established to obtain information on the abundance of pink and sockeye salmon in various locations along the Hawk Inlet Shore. This information would help determine appropriate fishing boundaries. More discussion about the test fishery will be presented later in this report.

The 1989 Southeast Alaska purse seine fishing season began on July 2 in limited areas. The first opening along the Hawk Inlet Shore was on July 9. The following information was reviewed prior to the July 7 opening announcement:

Drift Gill Net Fishery In District 11

Statistical Week	Pink Salmon Catch	% of Ave.(odd yrs 71-87)
25	122	64%
26	2,786	169%
27	26,445	226%

Canyon Island Fish Wheel Pink Salmon Catches

Year	Cumulative Catch through 7/6	Total Catch	Escapement
1985	2,310	27,670	1,051,871
1987	3,316	42,786	740,727
1989	3,507	-	-

Purse Seine Test Fishing Results

Date	Set Location	Reds	Coho	Pink	Chum
6/29	Lizard Head	58	0	389	81
	S. Funter	62	0	244	21
	N. Funter	23	0	122	41
	False Retreat	123	3	152	13
7/6	Lizard Head	28	1	241	47
	S. Funter	5	3	159	39
	N. Funter	73	0	665	29
	False Retreat	96	2	666	47

Aerial Surveys

7/5	Seymour	none showing
	Tenakee Inlet	some showing

Hawk Inlet Shore Jump Counts

	South of Funter Bay	9 pinks	5 chum or reds
7/5	North of Funter Bay	4 pink	2 chum or reds

The Taku Inlet gill net fishery was experiencing exceptionally good pink salmon catches as was the Canyon Island fish wheels, located approximately 20 miles up the Taku River. The catches were comparable with 1985 and 1987 also large escapement years. Hawk Inlet Shore test fishing and Juneau area aerial surveys did not reveal any large abundance of pinks. The District 11 gill net fishing success and catches in the Taku River fish wheels indicated a good abundance of Taku River pinks for an opening of the new Hawk Inlet Shore fishery on July 9.

Considering the good sockeye catches in the test fishery north of Funter Bay, and not knowing how many boats would participate in the fishery, a limited opening was announced on July 7. An earlier announcement on July 6 had given notice that the Hawk Inlet Shore area might be opened on short notice. The fishery objective was to harvest early run pinks over a few weeks rather than catching the sockeye limit in one opening, as might have occurred by fishing north of Funter Bay. The Hawk Inlet Shore south of Funter Bay and north of the latitude of Hanus Reef Light within two nautical miles of the Admiralty Island shore (Figure 1) was open for 10 hours from 9:00 a.m. through 7:00 p.m. July 9.

The two hour delayed opening and two hour earlier closure than other open areas was would limit the harvest and discourage the movement of boats to nearby open areas during the opening. As shown in Figure 2, Port Frederick and Tenakee Inlet were also open for a normal 15 hour opening from 6 a.m. to 9 p.m. along with areas in Districts 1,2,4,10, and 13.

Prior to the fishery, all 62 vessels were registered by department staff. Effort was spread all along the shore from the northern line at the southern entrance to Funter Bay to the southern line at the latitude of Hanus Reef Light. No vessels left the area prior to the closure. The weather was calm and sunny. The fishery was not as good as expected, with each boat averaging 50 sockeye and 1,500 pink salmon for the day. The total estimated fleet catch for the day of sockeye and pinks was 3,100 and 93,000, respectively.

On July 13 another seine opening was announced for July 16 in an area slightly larger than the July 9 opening. An area north of Point Marsden to Funter Bay was opened to allow harvest of southern bound pinks in addition to northbound pinks. A standard one-day (15 hour) opening was scheduled with notice of a possible extension. Information considered prior to the announcement was another week of good pink salmon catches in the District 11 gill net fishery, good catches of pinks at the Canyon Island fish wheels, mixed test fishing results, and aerial escapement surveys that indicated a good abundance of fish in many areas. The information reviewed prior to the opening announcement is shown below.

Drift Gill Net Fishery In District 11

Statistical Week	Pink Salmon Catch	% of Ave.(odd yrs 71-87)
25	122	64%
26	2,786	169%
27	26,445	226%
28	52,643	196%

Canyon Island Fish Wheel Pink Salmon Catches

Year	Cumulative Catch through 7/12	Annual Total Catch	Annual Escapement
1985	3,241	27,670	1,051,871
1987	11,388	42,786	740,727
1989	6,236	-	-

Hawk Inlet Shore Purse Seine Test Fishing Results for July 13

Date	Set Location	Reds	Coho	Pink	Chum
7/13	Lizard Head	45	7	2,386	42
	S. Funter Bay	43	3	349	13
	N. Funter Bay	53	3	84	5
	False Pt. Retreat	52	0	293	15
Estimated Catch of 7/09 Hawk Inlet Shore Opening					
	62 boats	3,500	500	110,000	5,300
Aerial Surveys					
7/10 and 7/12	Fish just beginning to show in most all terminal areas and stream mouths. Abundances appear good.				

During the July 16 opening several staff members and guests helped sample the catches aboard seine vessels. By early afternoon it was estimated that each boat would average approximately 100 sockeye and 5,000 pinks for the day. With 45 boats fishing, the total sockeye and pink catch for the day was estimated at 4,500 and 225,000 fish, respectively. The total area sockeye catch to that date was approximately 8,000 fish. With 7,000 sockeye left in the harvest limit and the fishery experiencing

excellent pink salmon catches, the fishing period was extended 24 hours to 9:00 p.m. Monday July 17.

During the second day of fishing, effort shifted more to the southern portion of the open area where pink salmon catches were better. Sampling aboard fishing vessels continued, although with less intensity than the day before. Catches of both sockeye and pink salmon appeared to be about the same as the day before. After the fishing period it was estimated that the fishery was very close to a total sockeye catch of 12,500. Another opening could not be scheduled without exceeding the 15,000 sockeye limit. No further openings occurred north of Point Marsden during July.

Some movement of boats was documented to and from the Hawk Inlet Shore fishing area during the second fishing period on July 16 and 17th. Of the 45 boats that fished the area, 4 boats left after the first day, 2 other boats left and returned later during the period, and three boats fished only the second day.

Purse seining continued south of Point Marsden in July and August with exceptionally large pink salmon catches. Fishing did not occur again north of Point Marsden until August 1 when the area was opened to the latitude of Hanus Reef for 9 hours at the end of an ongoing fishing period which was open from Pt. Marsden to Pt. Hepburn. No fishing occurred north of Point Marsden after August 1 due to an observed weakness of pink salmon in Lynn Canal and upper Stephens Passage. The 1989 preliminary catch for the July fishery north of Pt. Marsden was 15,032 sockeye, 671,590 pink, 19,189 chum, 1,258 coho and 179 chinook salmon.

Fishing was conducted in Subarea 112-16 from Point Marsden south to Point Hepburn on July 20, 23, 24, 27, 28, 30 and Aug.1, 4, 5, 6, 9, 10, 11, 14, 15, 16, 17, 20, 21, 22, 27, 28, 29, 30, for a total of 24 days . In total, Subarea 112-16 was open to seining 27 days during the 1989 season. The preliminary weekly catch data is shown in Table 6. Total annual catch and effort for subarea 112-16 from 1982 to 1989 is shown in Table 7.

HAWK INLET SHORE TEST FISHERY

The Hawk Inlet Shore test fishery was conducted along the northwestern shore of Admiralty Island between Hawk Inlet and False Point Retreat. The impetus for this test fishery was the 1989-90 Board of Fisheries action directing the department to provide for a purse seine fishery along this shore in July during years of high pink salmon abundance. The objective was to acquire information on the abundance of all salmon species at several selected fishing sites. One day of test fishing was planned each week for four weeks beginning the last week of June.

The contract originally called for test fishing through late July, however the need for the fishery faded after the sockeye limit was reached on July 17 and the fishery was not reopened. Test fishing consisted of the completion of one set at four selected sites shown in Figure 3 during three sampling days on June 29, July 6, and July 13. All test sets were made to the south for fish traveling north. Catches by species and location were obtained by the two department observers onboard the test fishing vessel. A detailed summary of the test fishing results is shown in Table 8.

Mid-eye to fork of tail length measurements were taken from pink salmon, scale samples were taken from sockeye salmon, and chums were sampled for adipose fin clips. In general, all the fish taken in small sets were sampled and larger sets were subsampled. As mentioned in Appendix A, no analysis can be made from the pink salmon length data taken during the test fishery to estimate the contribution of Taku River pink salmon stocks. A cursory look at the sockeye scales taken during the test fishery gave some insight into the stock composition and is discussed in Appendix B. No adipose fin clipped chum salmon were found during the test fishery.

The test fishing data suggests that sockeye abundance increases toward the north of the test fishing area. Pink salmon catch trends were not as definitely associated with location.

HARVEST OF LOCAL HATCHERY RETURNS IN THE HAWK INLET SHORE FISHERY

The implementation of the Hawk Inlet Shore fishery in 1989 caused concern about its impact on the hatchery returns to the State of Alaska hatchery in Port Snettisham and on the returns to the Douglas Island Pink and Chum, Inc. (DIPAC) hatcheries. Unfortunately, the 1989 Snettisham Hatchery chum salmon return was extremely poor and no tags were recovered anywhere in the seine fishery. DIPAC pink and chum salmon returns were not tagged, so no harvest data is available for the return. Table 9 shows the recent chum salmon returns to Snettisham Hatchery and the harvest rates it has experienced, based on tag recovery and fishery performance data. Snettisham chums contributed primarily to the District 11 drift gill net fishery in past years. No estimation of Snettisham chum contributions was made.

One gross method of estimating the DIPAC pink salmon contribution to the Hawk Inlet Shore fishery is to estimate the number of fish that escaped the commercial fisheries and determine the harvest rate the stock experienced. The harvest rates experienced by the wild stock pink returns can be estimated by making assumptions on migration paths and expansions of escapements to reflect the total abundance of pink salmon passing through the fishing area. The basic assumption used in this estimate is that the harvest rate of wild stock pinks must be equal to the harvest rate on the hatchery stocks passing through the fishing area. This method also presumes that all fish stocks entering the northern inside waters are represented in the fishing area. Knowing that a portion of the fish probably do not enter the fishing

area, this assumption makes the estimate of hatchery contribution lower than actual. Therefore, to give the hatchery more credit with this assumption and others that were used in this technique, a low and high estimate was calculated. The low estimate is based on the assumption that all the harvest and escapement in other areas was susceptible to harvest in the intercept area and that the actual escapements were four times the escapement index. This would make the number of available fish in the intercept area large and the resulting harvest rate small. The high estimate is based on the assumption that only half of the harvest in other areas was susceptible to harvest in the intercept area and that the escapement was equal to the escapement index. This would make the number of available fish in the intercept area smaller and the harvest rate higher.

The following formula was used to estimate the contribution of DIPAC pink salmon to the commercial seine fisheries in Northern Chatham Strait:

$$\text{Estimated Hatchery Contribution} = \frac{\text{Hatchery SHA Return}}{\text{Total est. of pinks in intercept area less intercept area harvest}} \times \text{Intercept Area Harvest}$$

In 1989 the low and high estimates were:

$$\text{Low Estimate of Hatchery Contribution} = \frac{82{,}111}{17{,}687{,}000} \times 3{,}120{,}000$$

$$= 14{,}500 \text{ fish for a harvest rate of } 15\%$$

$$\text{High Estimate of Hatchery Contribution} = \frac{82{,}111}{5{,}843{,}500} \times 3{,}120{,}000$$

$$= 43{,}800 \text{ fish for a harvest rate of } 35\%$$

Table 10 shows the estimated ranges of DIPAC Hatchery pink salmon contributions in past years to the Hawk Inlet Shore fishery using this same method of estimation.

Table 1. Commercial salmon harvest by species in District 114 by purse seine gear, 1960 to 1989.

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
1960	261	136,796	27,863	363,391	176,751	705,062
1961	336	213,619	52,531	2,913,987	535,784	3,716,257
1962	2,389	136,712	34,583	258,076	436,526	868,286
1963	2,055	201,535	109,133	9,016,292	328,398	9,657,413
1964	1,477	204,304	115,666	4,440,497	366,584	5,128,528
1965	3,309	280,730	152,488	3,168,720	581,094	4,186,341
1966	3,404	216,858	105,996	1,868,375	1,122,699	3,317,332
1967	1,461	160,019	93,347	1,549,756	627,225	2,431,808
1968	2,181	230,741	131,485	4,192,274	635,273	5,191,954
1969	3,409	231,535	66,410	2,413,330	199,149	2,913,833
1970	1,824	163,061	61,107	2,080,548	643,974	2,950,514
1971	1,683	89,395	81,047	1,646,526	494,289	2,312,940
1972	3,085	96,502	88,820	1,177,601	681,107	2,047,115
1973	2,726	130,788	47,743	921,233	350,179	1,452,669
1974	646	20,577	6,724	86,042	99,870	213,859
1975	22	2,365	549	24,714	41,488	69,138
1976	10	21	1,504	2,565	51,510	55,610
1977	0	0	0	0	0	0
1978	0	0	0	0	0	0
1979	0	3	130	1	3,584	3,718
1980	35	1,702	1,950	36,169	226,135	265,991
1981	314	11,059	6,803	735,131	135,888	889,195
1982	6	234	5,045	167,264	4,004	176,553
1983	178	2,421	4,202	328,934	36,700	372,435
1984	150	5,270	4,407	43,926	127,219	180,972
1985	576	3,638	4,314	1,051,611	53,115	1,113,254
1986	12	1,475	552	14,551	58,336	74,926
1987	132	3,793	2,241	541,592	121,321	669,079
1988	94	1,229	2,147	81,792	59,843	145,105
1989	39	5,643	3,015	518,471	14,552	541,720
Average	1,060	85,068	40,393	1,321,446	273,753	1,721,720

Table 2. Commercial salmon harvest by species in District 112 by purse seine gear, 1960 to 1989.

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
1960	87	12,399	5,774	103,730	49,363	171,353
1961	350	45,493	16,423	1,196,711	347,173	1,606,150
1962	651	11,148	3,795	38,668	130,936	185,198
1963	645	24,268	15,914	1,981,206	130,648	2,152,681
1964	1,076	34,225	35,204	1,563,094	111,082	1,744,681
1965	2,385	48,756	44,188	948,866	194,322	1,238,517
1966	1,005	28,737	26,464	1,162,287	587,484	1,805,977
1967	437	15,891	13,878	532,069	329,104	891,379
1968	700	41,874	35,860	2,532,342	207,061	2,817,837
1969	493	29,563	13,844	790,152	77,745	911,797
1970	850	49,548	71,370	2,018,297	501,090	2,641,155
1971	635	18,502	28,135	843,523	193,555	1,084,350
1972	1,766	33,578	42,889	1,079,704	487,645	1,645,582
1973	1,133	32,101	3,747	458,118	112,249	607,348
1974	414	23,540	7,965	204,590	152,329	388,838
1975	0	0	0	0	0	0
1976	0	0	0	0	0	0
1977	0	0	0	0	0	0
1978	55	1,261	2,913	604,812	11,119	620,160
1979	84	1,577	1,219	341,115	9,674	353,669
1980	32	1,153	3,554	286,783	82,498	374,020
1981	281	17,031	13,327	808,934	39,436	879,009
1982	1,037	26,387	62,157	5,892,839	90,787	6,073,207
1983	422	25,940	22,254	1,876,781	151,827	2,077,224
1984	720	22,269	17,492	1,133,240	856,024	2,029,745
1985	2,554	37,121	25,825	6,061,468	614,017	6,740,985
1986	1,191	8,386	8,680	344,025	606,286	968,568
1987	748	44,810	11,085	1,766,047	523,002	2,345,692
1988	737	3,856	11,579	599,192	348,393	963,757
1989	611	48,427	22,246	5,388,216	160,108	5,619,608
Average	703	22,928	18,926	1,351,894	236,832	1,631,283

Table 3. Commercial salmon harvest by species, Hawk Inlet Shore (Subarea 112-16), by purse seine gear, 1960 to 1989.

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
1960	64	7,590	2,494	42,641	12,879	65,668
1961	150	23,693	8,841	443,030	69,312	545,026
1962	256	5,395	1,647	12,605	42,524	62,427
1963	348	15,386	7,542	816,694	57,843	897,813
1964	545	18,287	20,202	610,076	33,047	682,157
1965	1,467	35,565	20,709	248,511	69,284	375,536
1966	332	10,198	6,216	210,835	53,042	280,623
1967	153	11,196	7,774	196,070	49,711	264,904
1968	429	26,702	19,972	1,109,096	73,153	1,229,352
1969	229	19,933	4,684	275,241	21,040	321,127
1970	439	34,742	39,134	855,233	164,085	1,093,633
1971	488	15,434	17,652	503,728	94,320	631,622
1972	1,417	24,035	28,973	327,832	183,160	565,417
1973	1,104	27,454	3,048	392,906	87,675	512,187
1974	227	18,287	3,632	87,805	39,716	149,667
1975	0	0	0	0	0	0
1976	0	0	0	0	0	0
1977	0	0	0	0	0	0
1978	0	0	0	0	0	0
1979	0	575	440	48,897	1,931	51,843
1980	0	633	1,410	71,720	9,040	82,803
1981	174	14,460	7,843	563,403	21,837	607,717
1982	247	10,756	25,806	2,565,846	19,508	2,622,163
1983	186	11,908	13,144	669,060	21,998	716,296
1984	161	15,326	12,624	771,591	98,510	898,212
1985	414	30,013	12,171	3,471,608	82,463	3,596,669
1986	2	4,716	3,359	154,259	7,844	170,180
1987	108	39,723	8,002	1,225,523	93,546	1,366,902
1988	13	303	1,222	44,570	2,583	48,691
1989	212	35,905	13,626	2,644,676	51,766	2,766,185
Average	305	15,260	9,735	611,757	48,711	685,767

Table 4. Commercial salmon harvest by species, Whitestone Shore (Subarea 114-27), by purse seine gear, 1960 to 1989.

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
1960	8	282	68	1,544	1,150	3,052
1961	101	22,399	4,882	554,275	85,344	667,001
1962	260	3,777	1,451	19,072	39,443	64,003
1963	592	11,165	7,364	931,967	50,286	1,001,374
1964	575	12,344	13,556	338,411	41,728	406,614
1965	927	10,349	11,468	166,869	48,824	238,437
1966	348	8,780	5,287	177,135	87,608	279,158
1967	196	4,300	3,709	116,407	52,762	177,374
1968	64	5,196	3,454	264,292	38,996	312,002
1969	524	8,874	5,563	475,421	41,196	531,578
1970	112	5,441	4,372	298,111	82,682	390,718
1971	350	3,425	8,327	307,798	81,415	401,315
1972	998	5,942	18,748	230,531	195,968	452,187
1973	505	7,544	4,380	211,217	65,860	289,506
1974	198	1,446	589	17,046	6,853	26,132
1975	9	883	111	9,971	3,947	14,921
1976	0	0	0	0	0	0
1977	0	0	0	0	0	0
1978	0	0	0	0	0	0
1979	0	0	0	0	0	0
1980	0	0	0	0	0	0
1981	306	10,793	2,729	698,719	34,247	746,794
1982	6	234	5,045	167,264	4,004	176,553
1983	152	2,336	3,288	328,144	25,893	359,813
1984	61	2,900	328	9,010	22,266	34,565
1985	323	2,169	2,874	694,777	22,200	722,343
1986	7	1,307	120	13,098	4,647	19,179
1987	115	3,122	1,137	524,771	26,932	556,077
1988	13	118	257	21,290	20,714	42,392
1989	37	5,492	2,769	518,404	13,482	540,184
Average	226	4,687	3,729	236,518	36,615	281,776

Table 5. Opening dates and northern boundaries of the Hawk Inlet Shore purse seine fishery (Subarea 112-16) from 1967 to 1989.

Year	S. of Pt. Marsden	N. of Pt. Marsden	Northern Boundary
1967	July 11	July 11	Lat. of Little Is.
1968	June 30	June 30	Lat. of Little Is.
1969	July 6	July 6	Lat. of Little Is.
1970	July 5	July 5	Lat. of Little Is.
1971	July 18	July 18	Lat. of Pt.Couverden
1972	July 3	July 3	Lat. of Pt. Couverden
1973	July 8	Not Open	
1974	August 6	Not Open	
1975	Not Open	Not Open	
1976	Not Open	Not Open	
1977	Not Open	Not Open	
1978	Not Open	Not Open	
1979	August 5	August 5	Lat. of Hanus Reef
1980	August 10	August 10	Lat. of Hanus Reef
1981	July 12	July 12	58 10' 00" N. Lat.
1982	August 1	August 1	Lat. of Hanus Reef
1983	July 24	July 24	Lat. of Hanus Reef
1984	July 22	August 2	Lat. of Hanus Reef
1985	July 18	August 1	Lat. of Hanus Reef
1986	August 7	Not Open	
1987	July 12	August 2	Lat. of Hanus Reef
1988	August 7	Not Open	
1989	July 20	July 9	58 13' 39" N. Lat.

Table 6. Hawk Inlet Shore purse seine fishery (Subarea 112-16) preliminary salmon harvest by week, 1989.

Stat. Week	Dates	Days Open	Chinook	Sockeye	Coho	Pink	Chum	Boats
28	7/9	1	28	3,595	237	113,577	5,799	62
29	7/16-17	2	151	11,437	1021	558,013	13,387	45
29	7/20 7/23-24	1	0	1,824	238	254,077	3,803	40
30	7/27-28 7/30	4	1	7,879	1,469	666,656	15,386	42
31	8/1,4-5	4	12	6,016	1,263	334,076	3,266	32
32	8/6,9-11	4	9	2,597	2,871	345,976	5,360	18
33	8/14-17	4	0	974	1,386	152,233	1,094	10
34	8/20-22	3	2	1,470	3,621	188,913	2,432	10
35	8/27-30	4	9	113	1,520	51,155	1,239	10
Total 112-16 harvest N. of Pt. Marsden during July								
		3	179	15,032	1,258	671,590	19,186	
Total 112-16 harvest after July fishery N. of Pt. Marsden								
		24	33	20,873	12,368	1,993,086	32,580	
1989 TOTAL 112-16								
		27	212	35,905	13,626	2,664,676	51,766	

Table 7. Hawk Inlet Shore purse seine fishery (Subarea 112-16) annual summary of harvest, fishing time and effort, 1982-89.

Year	Boat/ Days Effort	Peak Boats	Days Open	N. Line/[1/] Days	Catch in 1,000's Sockeye	Coho	Pink	Chum	Chinook
1982	1,054	95	17	H/15, M/2	10.8	25.8	2,565.8	19.5	0.2
1983	312	28	23	H/13, M/10	11.9	13.1	669.1	22.0	0.2
1984	510	72	15	H/5, M/10	15.3	12.6	771.6	98.5	0.2
1985	1,061	82	22	H/13, M/9	30.0	12.2	3,471.6	82.5	0.4
1986	54	11	6	M/6	4.7	3.4	154.3	7.8	0.0
1987	653	103	10	H/4, M/6	39.7	8.0	1,225.5	93.5	0.1
1988	30	15	2	M/2	0.3	1.2	44.6	2.6	0.0
1989	709	64	27	F/3, H/1, M/23	35.9	13.6	2,664.7	51.8	0.2

[1/] Northern Line during openings where H = latitude of Hanus Reef, M = Point Marsden, and F = a point at southern entrance to Funter Bay.

Table 8. Species composition and abundance of Hawk Inlet Shore purse seine test fishery, 1989.

June 29	Set Number	Set Location	Start Time	End Time	Total Time	Chinook	Sockeye	Coho	Pink	Chum	Total Catch
F/V St. Peter	1	Lizard Head	0815	0835	20	6	58	0	389	81	534
	2	South of Funter Bay	1020	1040	20	2	62	0	244	21	329
	3	North of Funter Bay	1215	1245	30	2	23	0	122	41	188
	4	False Point Retreat	1400	1425	25	3	123	3	152	13	294
Total					95	13	266	3	907	156	1,345
Mean					24	3	67	1	227	39	336
July 6											
F/V St. Peter	1	Lizard Head	0742	0806	24	2	28	1	241	47	319
	2	South of Funter Bay	1005	1033	28	0	5	3	159	39	206
	3	North of Funter Bay	1145	1211	36	0	73	0	665	29	767
	4	False Point Retreat	1354	1430	36	2	96	2	666	47	813
Total					124	4	202	6	1,731	162	2,105
Mean					31	1	51	2	433	41	527
July 13											
F/V St. Peter	1	Lizard Head	0941	1005	24	7	45	7	2,386	42	2,487
	2	South of Funter Bay	1147	1225	39	0	43	3	349	13	408
	3	North of Funter Bay	1356	1430	34	1	53	3	84	5	146
	4	False Point Retreat	1535	1602	27	3	52	0	293	15	363
Total					124	11	193	13	3,112	75	3,404
Mean					31	3	48	3	778	19	851

Table 9. Snettisham Hatchery chum returns and estimates of contribution, 1984-1989.

	Tag Expansion Estimates						Fishery Performance Estimates			
Year	Rack	Strays	Gill Net	Seine	Total	Harvest Rate	Gill Net	Seine	Total	Harvest Rate
1984	4,852	4,852	6,718	182	16,604	41.6%	15,000	400	25,104	61.3%
1985	24,436	13,687	24,251	3,241	65,615	41.9%	52,000	7,000	97,123	60.7%
1986	26,686	12,314	13,500	1,800	54,300	28.2%	16,000	2,000	57,000	31.6%
1987	50,250	12,500	12,037	1,456	76,243	17.7%	35,000	4,000	101,750	38.3%
1988	9,000	3,000	19,000	0	31,000	61.3%	48,000		60,000	80.0%
1989	3,000	500	0	0	3,500	0.0%	2,000		5,500	36.4%

Table 10. DIPAC Hatchery Special Harvest Area pink salmon returns, and estimates of commercial fisheries contributions, 1982 to 1989.

		Commercial Fisheries Estimated Contributions			
Year of Return	Hatchery Special Harvest Area Returns	Low Estimate	Harvest Rate %	High Estimate	Harvest %
1982	6,000	1,300	17.9	3,900	39.4
1983	80,000	7,700	8.8	27,400	25.5
1984	53,000	4,800	8.3	17,200	24.5
1985	429,100	75,200	14.9	245,100	36.4
1986	19,700	500	2.5	2,000	9.2
1987	770,000	89,200	11.3	313,700	30.9
1988	20,500	200	1.0	700	3.3
1989	66,600	14,500	15.0	43,800	34.8

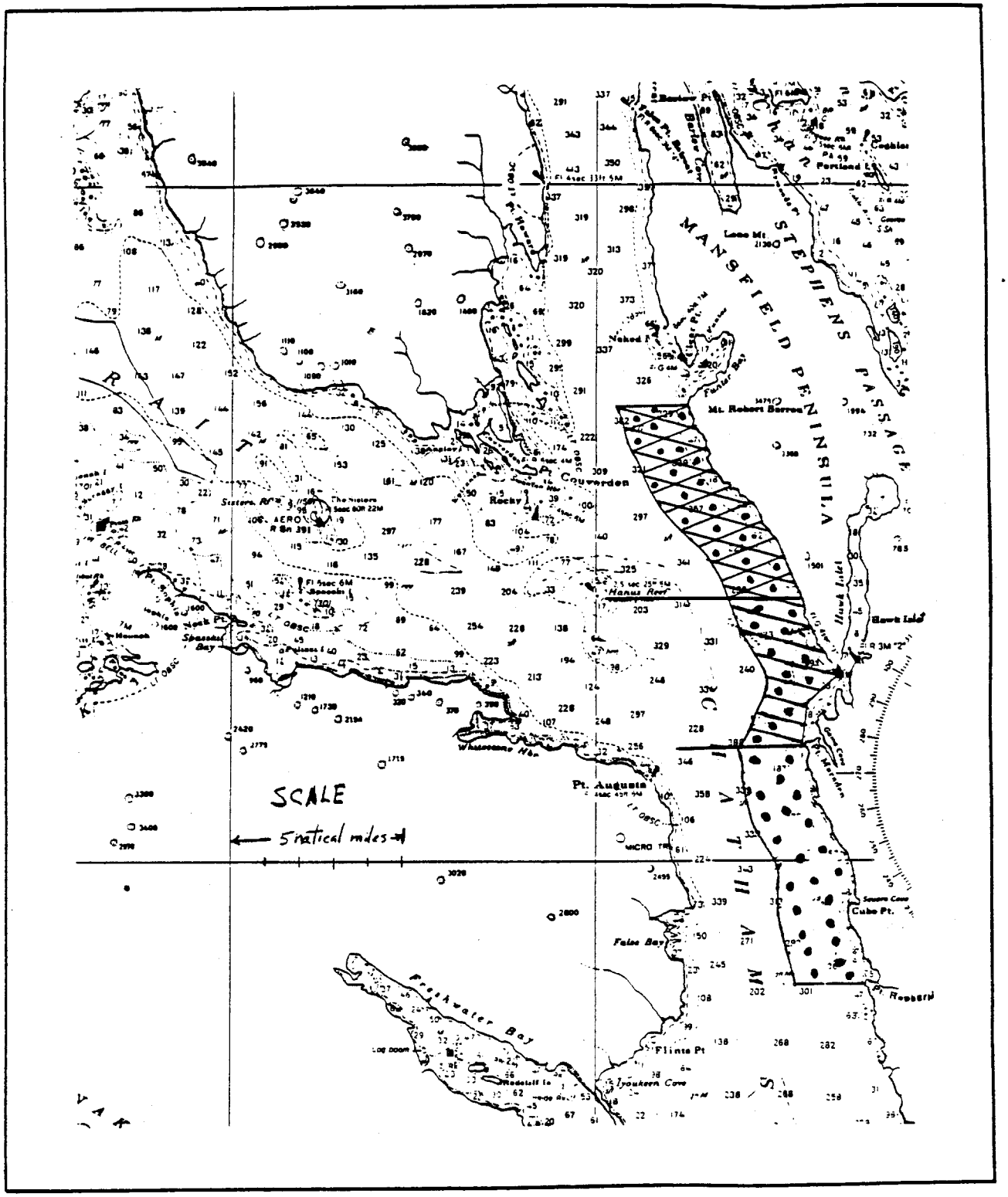

Figure 1. Expanded view of Hawk Inlet Shore statistical reporting Subarea 112-16 ⬚ with July 9 ⬚ and 16-17 ⬚, 1989 fishing area.

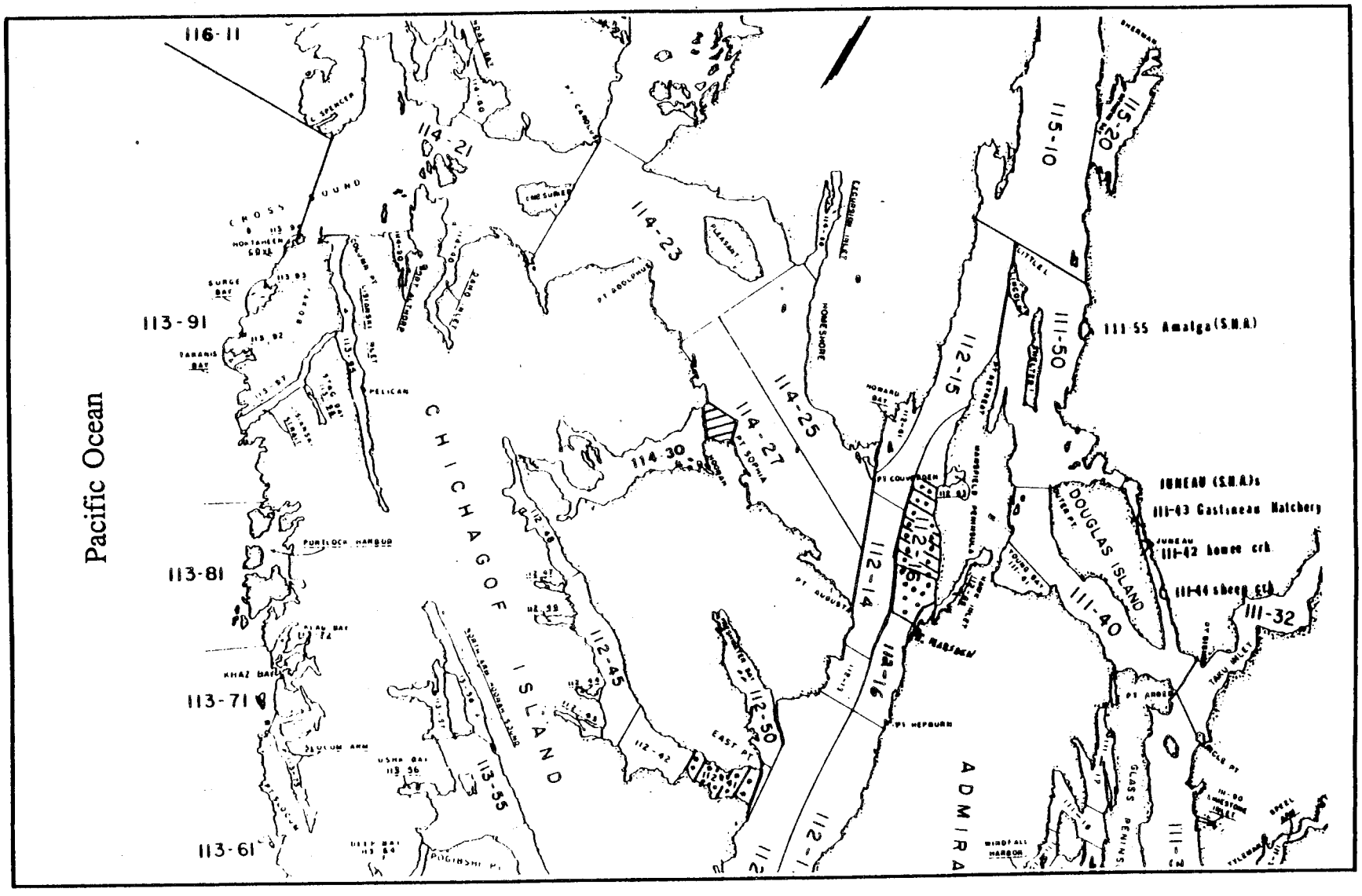

Figure 2. Northern Chatham Strait fishing areas on July 9 ▨ and July 16-17 ⁘, 1989.

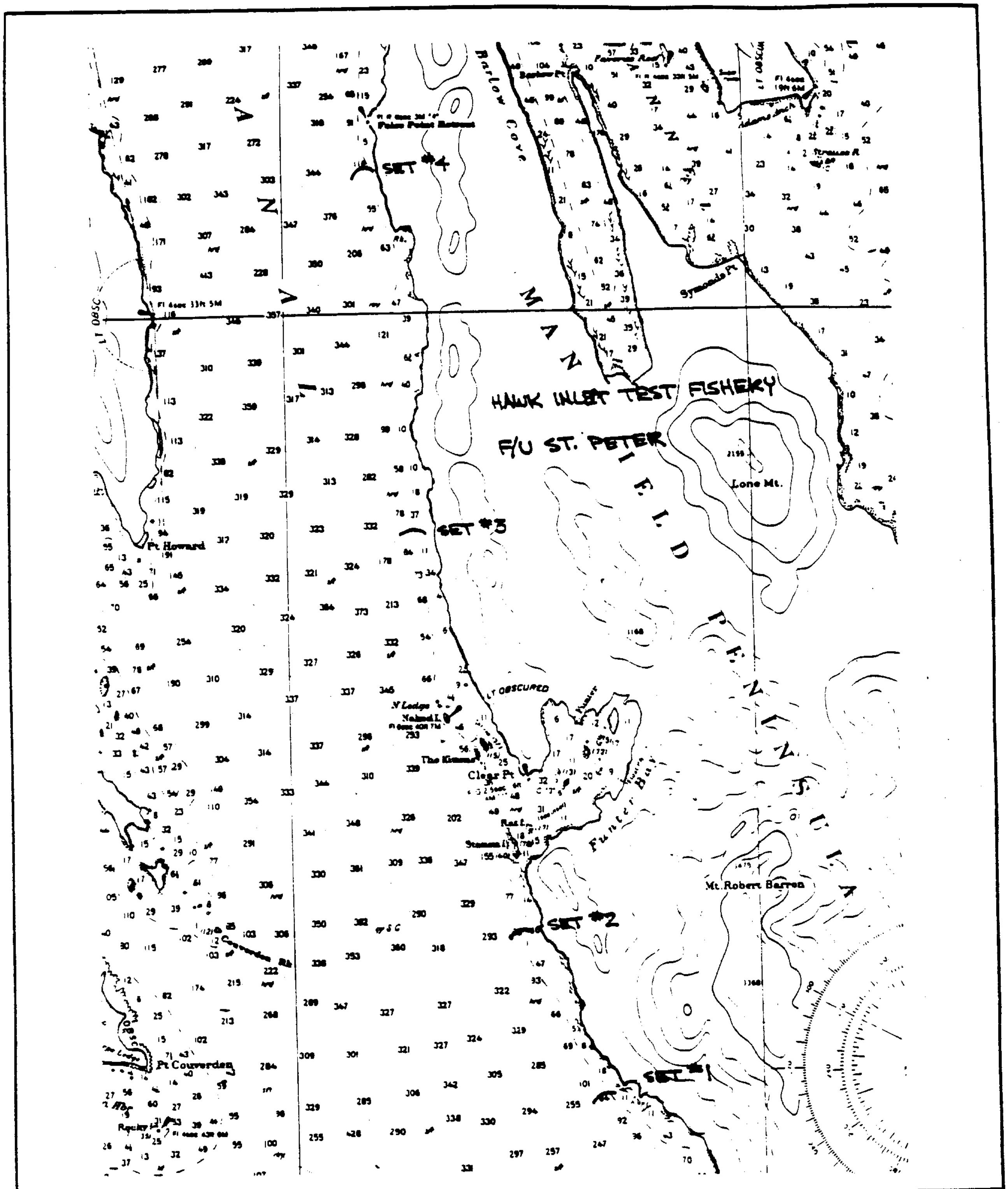

Figure 3. Hawk Inlet Shore test fishing locations 1989.

APPENDICES

APPENDIX A

ANALYSIS OF PINK SALMON LENGTHS IN THE JUNEAU AREA, 1989

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Introduction

An investigation was initiated in 1989 to discern whether or not Taku River pink salmon are significantly smaller than other northern Southeast Alaska pink salmon stocks. A size differential if present, could be used to discriminate between Taku River fish and others in the commercial fishery catches. In order to determine if Taku River fish are indeed smaller, samples of lengths were taken in 28 northern Southeast Alaskan streams, the Taku River (Canyon Island), and DIPAC hatcheries. The length data was divided into six groups or "stocks" as follows: Northern Chatham Strait, Seymour Canal, Upper Stephen's Passage, Tenakee-Freshwater Bay, Taku River, and DIPAC.

Methods

The first step in analyzing the data was to determine if there was any difference in the mean length of the salmon from each "stock". A one-way analysis of variance was performed on the length data from the six "stocks" to see if there was a statistically significant difference in their mean lengths.

It became obvious that there was a statistically significant difference in the average lengths of the six "stocks". However, some caution must be used in the interpretation of this since the sample size was so large (4,385 observations). With very large sample sizes, differences can be found which are statistically significant, but not practically significant. In other words, the test can be more discriminating than it needs to be. Another potential problem in the analysis is that the sample of lengths that was collected for each "stock" may not be totally representative of the entire run for that "stock". The DIPAC hatchery length data was taken from fish used for egg-takes and most of it came from the latter portion of the run. The length data for the other "stocks" was gathered by foot surveys of streams on a few specific days, the effort not necessarily spread out over the entire length of the run. The length information for most of the "stocks" came from the mid to latter portion of the run. An exception to this was the data from the Taku River (Canyon Island) which was obtained from a fish wheel and gathered on a large number of days throughout the run.

In this first analysis it was assumed that the sex of the fish was not important. However, the ratio of males to females in the sample for a particular "stock" could influence the average length calculated for the "stock" since males are typically larger than females. This, in turn, could effect any analysis performed on the mean lengths.

In an attempt to circumvent the problem of the ratio of males to females in the sample of a particular "stock", the analysis was repeated for both males and females to see if the there was a significant difference in the mean lengths for a particular sex. Indeed, it became obvious that there was a statistically significant difference in the mean lengths of the six "stocks" for both males and females. However, we again hade to use caution in interpreting the information due to the large sample sizes for each sex (2,124 males and 2,261 females).

The next step in the analysis was to see if some form of discriminant function analysis or mixture model could be used to discriminate between these "stocks" in the commercial fishery catch. To see how well these procedures might work for the combined sample, a graph of frequency percent (of length) vs length was made for each "stock" on the same set of axes. The graphs of the frequency percents overlapped to such an extent that it was apparent that it would be nearly impossible to discriminate between the six "stocks" based solely on the criterium of length. This was also true when males and females were examined individually. This conclusion was reaffirmed when the pink salmon lengths of all the "stocks" were combined and a graph of frequency percent vs length was made. The graph showed a nearly Normal (bell shaped) distribution of lengths. It was apparent that all of the salmon lengths from the six stocks were merely components of a much larger single distribution of lengths.

Therefore, even though there is a statistically significant difference in the mean lengths of the stocks, there is enough variation in the individual fish lengths that discrimination between the stocks based on the individual fish lengths would be nearly impossible.

Analysis

As stated earlier, the first step in analyzing the data was to perform an analysis of variance on the combined data of males and females. From this analysis of variance, an F statistic was computed. The F statistic is what is actually used to determine if the means are significantly different. If the means are equal, then the F statistic should be close to 1; if they are not equal, then the F statistic should be significantly larger than 1. For each F statistic there is an associated p-value. The p-value can be thought of as the probability of getting an F statistic as large or larger than the F statistic in question if the means are equal. Therefore, if the p-value is small, then the probability that the means are equal is small. The test produced the following F statistic:

$F_{5,4379} = 81.01$, which has a p-value = 0.0

The numbers which appear as subscripts to the F statistic are called degrees of freedom. The first number depends on the number of groups being compared, and the second depends on the number of groups being compared and the number of observations in the sample. These are necessary in order to evaluate the F statistic and find the associated p-value.

The analysis was repeated for males and females individually. The resulting F statistics were as follows:

Males	Females
$F_{5,2118} = 67.30$	$F_{5,2255} = 34.82$
p-value = 0.0	p-value = 0.0001

Assuming that the differences in the mean lengths were both statistically and practically significant for males, females, and the combined sample, the next step was to determine where the differences in the mean lengths occurred. The Student-Newman-Keuls multiple comparisons procedure was employed on the mean lengths of the groups. For the combined sample it was determined that the mean lengths of Seymour Canal and Upper Stephen's Passage were not significantly different, but that all other pairings of "stocks" were significantly different. It must be kept in mind, however, that the ratio of males to females will effect the average length found for each "stock", and therefore effect any analysis done on the average lengths. The average lengths were as follows:

		# of males	# of females	Ratio of M to F
Tenakee-Freshwater Bay	483 mm	298	256	1.16
Northern Chatham Strait	474 mm	239	255	0.94
Upper Stephen's Passage	469 mm	290	443	0.65
Seymour Canal	467 mm	405	322	1.26
DIPAC hatcheries	455 mm	435	425	1.02
Taku (Canyon Island)	450 mm	457	560	0.82

For the males it was determined that the mean lengths of North Chatham Strait and Upper Stephen's Passage were not significantly different, Upper Stephen's Passage and Seymour Canal were not

significantly different, but all other pairings of "stocks" were significantly different. The average lengths were as follows:

Tenakee-Freshwater Bay	492 mm
North Chatham Strait	480 mm
Upper Stephen's Passage	477 mm
Seymour Canal	472 mm
Taku (Canyon Island)	453 mm
DIPAC hatcheries	446 mm

For the females it was determined that the mean lengths of North Chatham Strait, DIPAC hatcheries, and Upper Stephen's Passage were not significantly different, Upper Stephen's Passage and Seymour Canal were not significantly different, but all other pairings of "stocks" were significantly different. The average lengths were as follows:

Tenakee-Freshwater Bay	473 mm
North Chatham Strait	468 mm
DIPAC hatcheries	465 mm
Upper Stephen's Passage	464 mm
Seymour Canal	460 mm
Taku (Canyon Island)	448 mm

It is interesting to note that DIPAC is the only "stock" where the males had a shorter average length than the females.

The analysis ended here. Discriminant function analysis or mixture model analysis did not need to be performed since it was determined that there was too much variation in the individual fish lengths to make use of these procedures.

Conclusion

It was determined from the analysis of the length data that classifying pink salmon into "stocks" based on length alone is not an effective method. However, the length data in conjunction with some other measurement from the salmon may prove to be useful in determining stock membership. There may be other characteristics of pink salmon which, of themselves, are no better than length in discriminating between stocks, but if these indicators are used in conjunction with length, the resulting combination could be effective. It is also possible that another characteristic of pink salmon could be found which is capable of being used as a sole means of discriminating between stocks.

APPENDIX B

DISTRICT 12 SOCKEYE SCALE ANALYSIS, 1989

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Introduction

The following is a qualitative stock ID for District 112 sockeye during the 1989 season. Note that the analysis is qualitative, nothing to hang our hats on, but something that gives us reasonably accurate estimates of interceptions of Chilkoot and Chilkat Lake sockeye in District 112.

Methods

All of the District 112 sockeye scales collected from the commercial catch and test fishery in 1989 were aged. As they were aged, a subjective determination was made as to whether or not one or two distinct patterns could be identified for each scale. The first pattern was the very small freshwater pattern seen in Chilkoot and Crescent Lake fish. In 1989 most of this pattern was probably Chilkoot Lake fish, based on the very small return to Crescent Lake, although some Crescent Lake fish are included in the Chilkoot Lake estimates. The second pattern was the large freshwater pattern from Chilkat Lake sockeye.

Stock Composition

The qualitative stock compositions for the commercial catch and test fishery are shown in Appendix B.1.

The stock composition for the commercial catch was estimated separately for Subdistrict 112-16 and District 112 general (everything else but Subdistrict 112-16). All weeks except statistical week 30 were discreet samples for the two areas. There were no samples to allocate 4,003 fish from statistical weeks 26+29+33+34.

The overall stock composition in Subdistrict 112-16 was 31% Chilkoot Lake (including some Crescent Lake) fish, and 21% Chilkat Lake, or over 50% combined Chilkoot plus Chilkat. These fish were most prevalent after statistical week 30. In the District 112 general samples Chilkoot/Crescent patterns comprised 17% and Chilkat 10% of the catch. A total of 41,575 fish were allocated between the two areas and 26% were Chilkoot/Crescent and 17% Chilkat. Overall, 43% of the District 112 allocated catch was composed of Chilkoot and Chilkat Lake patterns. The remainder (57%) is composed of island stocks (Kook, Pavlof, Sitkoh, and Hasselborg), mainland stocks (Auke, Windfall, Speel, Chilkat Mainstem, and Berners Bay), and Taku River stocks.

The Hawk Inlet test fishery operated in statistical weeks 26, 27, and 28 in each of four sites - Lizard Head, South of Funter Bay, North of Funter Bay, and False Point Retreat in the northern section of Subdistrict 112-16. Overall (weeks combined), the stock composition was 61% combined Chilkoot/Crescent plus Chilkat patterns, divided equally between the two groups. Weekly stock composition was 60% (week 26), 67% (week 27), and 55% (week 28).

The stock composition by area showed no differences in stock composition, ranging from 57% at Lizard Head to 63% at False Point Retreat.

Age Composition

Age compositions for the various scale collections are shown in Appendices B.2-B.8. Subdistrict 112-16 shows a greater percent of age 2.2 and 2.3 fish than District 112 general, indicative of Chilkoot/Chilkat fish. Both District 112 commercial catch collections show a large percent of age 0. fish, 12% in Subdistrict 112-16 and 19% in District 112 general. The Subdistrict 112-16 age 0 fish are mixed bag of Chilkat Mainstem, Taku River, and Hasselborg. The District 112 general are most likely a majority of Hasselborg River. The age 0 fish in the District 112 test fishery (7%) are mostly Chilkat Mainstem based on timing and the large percentage of Chilkoot and Chilkat Lake patterns, but could include some Hasselborg fish.

Appendix B.1. Qualitative stock composition of sockeye salmon catches in District 112, 1989.

Part A - District 112 Commercial Purse Seine Catch

Stat. Week		112-16			112 (other than 112-16)			District 112 combined			Un-Allocated Catch
		Chilkoot	Chilkat	Total	Chilkoot	Chilkat	Total	Chilkoot	Chilkat	Total	
26	N										
	%										
	Catch										204
27	N				9	9	133				
	%				6.8	6.8		6.8	6.8		
	Catch				59	59	865	59	59	865	
28	N	123	63	409							
	%	30.1	15.4					30.1	15.4		
	Catch	1,083	555	3,600				1,083	555	3,600	
29	N	160	44	505							
	%	31.7	8.7					31.7	8.7		
	Catch	3,952	1,087	12,474				3,952	1,087	12,474	3,182
30	N				15	8	98				
	%				15.3	8.2		15.3	8.2		
	Catch				1,364	728	8,912	1,364	728	8,912	
31	N	91	83	254	9	5	40				
	%	35.8	32.7		22.5	12.5		30.7	25.0		
	Catch	2,155	1,966	6,016	835	464	3,713	2,991	2,430	9,729	
32	N	31	26	129	28	19	98				
	%	24.0	20.2		28.6	19.4		25.1	20.0		
	Catch	624	523	2,597	220	149	769	844	673	3,366	
33	N	43	94	174							
	%	24.7	54.0					24.7	54.0		
	Catch	241	526	974				241	526	974	364
34	N	37	118	172							
	%	21.5	68.6					21.5	68.6		
	Catch	316	1,008	1,470				316	1,008	1,470	253
35	N				9	28	53				
	%				17.0	52.8		17.0	52.8		
	Catch				31	98	185	31	98	185	
Total											
	%	30.9	20.9		17.4	10.4		26.2	17.2		
	Catch	8,371	5,665	27,131	2,509	1,497	14,444	10,880	7,162	41,575	4,003

--Continued--

Part B - Test Fishery (Weeks 26-28)

Stat. Week		(Four Areas Combined) Chilkoot	Chilkat	Total	Chilkoot/ Chilkat
26	N	35	71	178	
	%	19.7	39.9		59.6
27	N	53	37	135	
	%	39.3	27.4		66.7
28	N	44	19	115	
	%	38.3	16.5		54.8
Total					
	%	31.0	30.0		61.0

By Individual Area -- Statistical Weeks Combined

Stat. Week		Chilkoot	Chilkat	Total	Chilkoot/ Chilkat
Site 1 - Lizard Head					
	N	18	20	67	
	%	26.9	29.9		56.7
Site 2 - South of Funter Bay					
	N	29	37	107	
	%	27.1	34.6		61.7
Site 3 - North of Funter Bay					
	N	30	17	82	
	%	36.6	20.7		57.3
Site 4 - False Pt. Retreat					
	N	55	53	172	
	%	32.0	30.8		62.8

Appendix B.2. Age composition of sockeye salmon in the District 112-16 seine catch by age class and fishing period, 1989.

	Brood Year and Age Class													
	1987	1986	1986	1985	1985	1985	1984	1984	1984	1983	1983	1983	1982	
	0.1	0.2	1.1	0.3	1.2	2.1	1.3	2.2	3.1	1.4	2.3	3.2	3.3	Total
Statistical Week 28 (July 9 - 15)														
All Fish														
Sample Size	1	9	7	34	25	4	212	35	1	1	80			409
Percent	0.2	2.2	1.7	8.3	6.1	1.0	51.8	8.6	0.2	0.2	19.6			100.0
Std. Error	0.2	0.7	0.6	1.3	1.1	0.5	2.3	1.3	0.2	0.2	1.8			
Number	9	79	62	299	220	35	1,866	308	9	9	704			3,600
Statistical Week 29 (July 16 - 22)														
All Fish														
Sample Size		6		72	72	2	229	47		1	75		1	505
Percent		1.2		14.3	14.3	0.4	45.3	9.3		0.2	14.9		0.2	100.0
Std. Error		0.5		1.5	1.5	0.3	2.2	1.3		0.2	1.6		0.2	
Number		148		1,778	1,778	49	5,657	1,161		25	1,853		25	12,474
Statistical Week 31 (July 30 - August 5)														
All Fish														
Sample Size		5	1	14	24	1	101	65			43			254
Percent		2.0	0.4	5.5	9.4	0.4	39.8	25.6			16.9			100.0
Std. Error		0.9	0.4	1.4	1.8	0.4	3.0	2.7			2.3			
Number		118	24	332	568	24	2,392	1,540			1,018			6,016
Statistical Week 32 (August 6 - 12)														
All Fish														
Sample Size				21	15		47	31			15			129
Percent				16.3	11.6		36.4	24.0			11.6			100.0
Std. Error				3.2	2.8		4.1	3.7			2.8			
Number				423	302		946	624			302			2,597
Statistical Week 33 (August 13 - 19)														
All Fish														
Sample Size				4	13		33	85			38		1	174
Percent				2.3	7.5		19.0	48.9			21.8		0.6	100.0
Std. Error				1.0	1.8		2.7	3.4			2.8		0.5	
Number				22	73		185	476			213		6	974
Statistical Week 34 (August 20 - 26)														
All Fish														
Sample Size				3	7		25	84			52		1	172
Percent				1.7	4.1		14.5	48.8			30.2		0.6	100.0
Std. Error				0.9	1.4		2.5	3.6			3.3		0.5	
Number				26	60		214	718			444		9	1,470
Statistical Week 35 (August 27 - Sept. 2)														
All Fish														
Sample Size				1	9		14	18	1		9	1		53
Percent				1.9	17.0		26.4	34.0	1.9		17.0	1.9		100.0
Std. Error				1.6	4.4		5.2	5.5	1.6		4.4	1.6		
Number				3	31		49	63	3		31	3		185

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	Brood Year and Age Class													
	1987	1986	1986	1985	1985	1985	1984	1984	1984	1983	1983	1983	1982	
	0.1	0.2	1.1	0.3	1.2	2.1	1.3	2.2	3.1	1.4	2.3	3.2	3.3	Total
Combined Periods (Percentages are weighted by period catches)														
All Fish														
Sample Size	1	20	8	149	165	7	661	365	2	2	312	1	3	1,696
Percent	<0.1	1.3	0.3	10.6	11.1	0.4	41.4	17.9	<0.1	0.1	16.7	<0.1	0.1	100.0
Std. Error	<0.1	0.3	0.1	0.8	0.9	0.2	1.3	0.9	<0.1	0.1	1.0	<0.1	0.1	
Number	9	346	85	2,884	3,033	108	11,308	4,889	12	34	4,566	3	39	27,316

Number of Chilkoot and Chilkat Lake scales each week:

Stat. Week	Chilkoot	Chilkat
28	123	63
29	160	44
31	91	83
32	31	26
33	43	94
34	37	118
35	9	28
Encountered	494	456

Appendix B.3. Age composition of sockeye salmon in the District 112 general (no 112-16) seine catch by age class and fishing period, 1989.

	Brood Year and Age Class											
	1986	1986	1985	1985	1985	1984	1984	1983	1983	1983	1982	
	0.2	1.1	0.3	1.2	2.1	1.3	2.2	1.4	2.3	3.2	3.3	Total
Statistical Week 27 (July 2 - 8)												
All Fish												
Sample Size			5	10	1	103	7	1	5	1		133
Percent			3.8	7.5	0.8	77.4	5.3	0.8	3.8	0.8		100.0
Std. Error			1.5	2.1	0.7	3.3	1.8	0.7	1.5	0.7		
Number			33	65	7	670	46	7	33	7		865
Statistical Week 30 (July 23 - 29)												
All Fish												
Sample Size	1	1	22	10		44	9		9	1	1	98
Percent	1.0	1.0	22.4	10.2		44.9	9.2		9.2	1.0	1.0	100.0
Std. Error	1.0	1.0	4.2	3.1		5.0	2.9		2.9	1.0	1.0	
Number	91	91	2,001	909		4,001	818		818	91	91	8,912
Statistical Week 31 (July 30 - August 5)												
All Fish												
Sample Size			5	3		24	3	1	4			40
Percent			12.5	7.5		60.0	7.5	2.5	10.0			100.0
Std. Error			5.3	4.2		7.8	4.2	2.5	4.8			
Number			464	278		2,228	278	93	371			3,713
Statistical Week 32 (August 6 - 12)												
All Fish												
Sample Size			16	11		39	22		10			98
Percent			16.3	11.2		39.8	22.4		10.2			100.0
Std. Error			3.5	3.0		4.6	4.0		2.9			
Number			126	86		306	173		78			769
Combined Periods (Percentages are weighted by period catches)												
All Fish												
Sample Size	1	1	48	34	1	210	41	2	28	2	1	369
Percent	0.6	0.6	18.4	9.4	<0.1	50.5	9.2	0.7	9.1	0.7	0.6	100.0
Std. Error	0.6	0.6	3.0	2.2	<0.1	3.8	2.1	0.6	2.2	0.6	0.6	
Number	91	91	2,623	1,339	7	7,205	1,315	99	1,301	97	91	14,259

Summary of Chilkoot and Chilkat Scales each week:

Stat. Week	Chilkoot	Chilkat
27	9	9
30	15	8
31	9	5
32	28	9
Encountered	61	41

Appendix B.4. Age composition of sockeye salmon in the District 112-16 test fishing catch by age class and fishing period, 1989.

	Brood Year and Age Class								
	1986	1986	1985	1985	1985	1984	1984	1983	
	0.2	1.1	0.3	1.2	2.1	1.3	2.2	2.3	Total
Statistical Week 26 (June 25 - July 1)									
All Fish									
Sample Size	1	1	8	11		96	14	47	178
Percent	0.6	0.6	4.5	6.2		53.9	7.9	26.4	100.0
Std. Error	0.5	0.5	1.4	1.6		3.4	1.8	3.0	
Statistical Week 27 (July 2 - 8)									
All Fish									
Sample Size	1		8	9		93	5	19	135
Percent	0.7		5.9	6.7		68.9	3.7	14.1	100.0
Std. Error	0.7		1.9	2.0		3.7	1.5	2.8	
Statistical Week 28 (July 9 - 15)									
All Fish									
Sample Size	2	2	7	12	1	74	4	13	115
Percent	1.7	1.7	6.1	10.4	0.9	64.3	3.5	11.3	100.0
Std. Error	1.2	1.2	2.1	2.7	0.8	4.2	1.6	2.8	
Combined Periods (Percentages are weighted by period catches)									
All Fish									
Sample Size	4	3	23	32	1	263	23	79	428
Percent	1.0	0.8	5.5	7.8	0.3	62.4	5.0	17.3	100.0
Std. Error	0.5	0.4	1.1	1.2	0.3	2.2	1.0	1.7	

Summary of Chilkoot and Chilkat scales each week:

Stat. Week	Chilkoot	Chilkat
26	35	71
27	53	37
28	44	19
Encountered	132	127

Appendix B.5. Age composition of sockeye salmon in the District 112-16 Lizard Head test fishing catch by age class, 1989.

	Brood Year and Age Class						
	1986	1985	1985	1984	1984	1983	
	0.2	0.3	1.2	1.3	2.2	2.3	Total
Statistical Weeks 26 - 28 (June 25 - July 15)							
All Fish							
Sample Size	1	5	5	39	2	15	67
Percent	1.5	7.5	7.5	58.2	3.0	22.4	100.0
Std. Error	1.4	3.1	3.1	5.9	2.0	5.0	

Summary of Chilkoot and Chilkat scales:

	Chilkoot	Chilkat
Encountered	18	20

Appendix B.6. Age composition of sockeye salmon in the District 112-16 North of Funter Bay test fishing catch by age class, 1989.

	Brood Year and Age Class					
	1985	1985	1984	1984	1983	
	0.3	1.2	1.3	2.2	2.3	Total
Statistical Weeks 26 - 28 (June 25 - July 15)						
All Fish						
Sample Size	6	7	54	4	11	82
Percent	7.3	8.5	65.9	4.9	13.4	100.0
Std. Error	2.8	3.0	5.0	2.3	3.6	

Summary of Chilkoot and Chilkat scales:

	Chilkoot	Chilkat
Encountered	30	17

Appendix B.7. Age composition of sockeye salmon in the District 112-16 False Retreat test fishing catch by age class, 1989.

	Brood Year and Age Class							
	1986	1985	1985	1985	1984	1984	1983	
	0.2	0.3	1.2	2.1	1.3	2.2	2.3	Total
Statistical Weeks 26 - 28 (June 25 - July 15)								
All Fish								
Sample Size	3	3	11	1	113	10	31	172
Percent	1.7	1.7	6.4	0.6	65.7	5.8	18.0	100.0
Std. Error	0.9	0.9	1.7	0.5	3.3	1.6	2.7	
Number	17	17	64	6	657	58	180	1,000

Summary of Chilkoot and Chilkat scales

	Chilkoot	Chilkat
Encountered	55	53

Appendix B.8. Age composition of sockeye salmon in the District 112-16 South Funter Bay test fishing catch by age class, 1989.

	Brood Year and Age Class						
	1986	1985	1985	1984	1984	1983	
	1.1	0.3	1.2	1.3	2.2	2.3	Total
Statistical Weeks 26 - 28 (June 25 - July 15)							
All Fish							
Sample Size	3	9	9	57	7	22	107
Percent	2.8	8.4	8.4	53.3	6.5	20.6	100.0
Std. Error	1.5	2.5	2.5	4.6	2.3	3.7	

Summary of Chilkoot and Chilkat scales:

	Chilkoot	Chilkat
Encountered	29	37

APPENDIX C

COHO HARVEST BY THE PURSE SEINE FISHERY IN ICY AND NORTHERN CHATHAM STRAITS

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Introduction

The Alaska Department of Fish and Game has frequently received comments from members of the public who are concerned about the impact of the purse seine fishery in Icy and northern Chatham Straits on the availability of coho salmon to the Juneau marine sport fishery and on spawning escapements of coho salmon stocks in the Juneau area. The most recent controversy centers around the Hawk Inlet Shore fishery (Subdistrict 112-16) which occurs along the northwestern shore of upper Chatham Strait and was expanded in 1989 by the Alaska Board of Fisheries to allow purse seine fishing over a larger area during July. In response to public concern about the effect of that fishery, available information on the historical magnitude and timing of the purse seine catch and its relative impact on selected coho salmon stocks in the Juneau area is briefly summarized in this appendix.

Historical Catches

The Icy Strait-northern Chatham Strait corridor is a major migration route of coho salmon returning to systems draining into Stephens Passage and Lynn Canal. Historically, fish traps and purse seine fisheries in this area have made substantial catches of all five species of Pacific salmon. Fish traps were curtailed in 1959, but a major purse seine fishery continued until it was also substantially reduced beginning in the early 1970s. Purse seine catches of coho salmon in Icy and northern Chatham Straits during 1960-1973 averaged 98,692 fish and ranged from 32,469 to 174,955 (Appendix C.1). Catches in this area during 1974-1988 have averaged only 9,289 fish and ranged from 0 to 36,189.

The fishery in District 14 has been drastically curtailed since the early 1970s, but a limited mixed-stock fishery in District 12 along the Hawk Inlet Shore (Subdistrict 112-16) has continued in recent years. Coho salmon catches in the Hawk Inlet area have averaged 5,977 fish (range 0-25,806) during 1974-1988 compared with 13,492 (range 1,647-39,134) during 1960-1973.

Harvest Timing

The purse seine fishery in Icy and northern Chatham Straits targets primarily on pink salmon and, therefore, peak effort levels typically occur during the pink salmon migration in July and early August. In recent years, the average catch of coho salmon in this area peaked during the first half of August (Appendix C.2) which is several weeks before the typical peak of coho salmon catch rates in other inside net fisheries (early to mid-September). Therefore, it is evident that the purse seine fishery selects for earlier migrating fish. The timing and proximity of the harvest of coho salmon by the purse seine fishery in Subdistrict 112-16 indicates that it probably harvests a mix of stocks similar to the Juneau sport fishery, with the exception that the purse seine catch may include a significant contribution by stocks from systems along Chatham Strait.

Harvest of Individual Stocks

Coded-wire tag estimates of stock distributions for three wild coho salmon stocks provide an indication of the relative impact of the purse seine fisheries on coho salmon populations in the Juneau area (Appendix C.3). The Speel Lake stock exhibits timing typical of fall stocks in Taku River and Port Snettisham systems that are earlier and more protracted in their migration compared to the distinctively late migrating stocks that predominate in Lynn Canal, e.g., the Berners River. The Auke Creek stock is intermediate in timing between these major stock groups.

The data indicate that the purse seine harvest has accounted for a relatively small percentage (usually 5% or less) of coho salmon returns to these indicator systems during most years. An exception occurred in 1982 when the purse seine fishery was estimated to have harvested a significant percentage of the returns to Auke and Speel Lakes (17.5% and 33.7%, respectively). These are relatively rough estimates because total tag recovery samples were small. Coho salmon were highly available in inside waters early in the season during 1982 and high total catches of 25,806 and 20,747, respectively, occurred in the Hawk Inlet purse seine and Juneau marine sport fisheries.

The major Lynn Canal stocks are relatively unimpacted by purse seine fisheries because of their late migration timing.

Insufficient information is available to evaluate the effect of purse seine fisheries on early migrating summer coho salmon stocks in the upper Taku River system. The majority of the migration of these early stocks into the Taku River occurs during mid-July through mid to late August and, therefore, they are likely to incur harvest by mixed-stock purse seine fisheries targeting on pink salmon. Decreased average early season coho salmon catch rates in the Juneau marine sport and District 11 drift gill net

fisheries in the 1980s compared with the previous decade indicate a possible decline in production in recent years.

Summary

Available data indicates that current purse seine fisheries in Icy and northern Chatham Straits usually do not have a major impact on the predominant fall coho salmon stocks in the Juneau area. However, the impact of the purse seine harvest can be large enough to be an important management consideration during years of high pink salmon abundance combined with a high availability of coho salmon in inside waters. Catch data dating to 1960 indicates that, historically, much larger coho salmon catches were made by purse seine fisheries in Icy and northern Chatham Straits before 1974 compared with more recent years. Therefore, the overall impact of purse seine fisheries on coho salmon returns to the Juneau area has probably also been reduced significantly since that period.

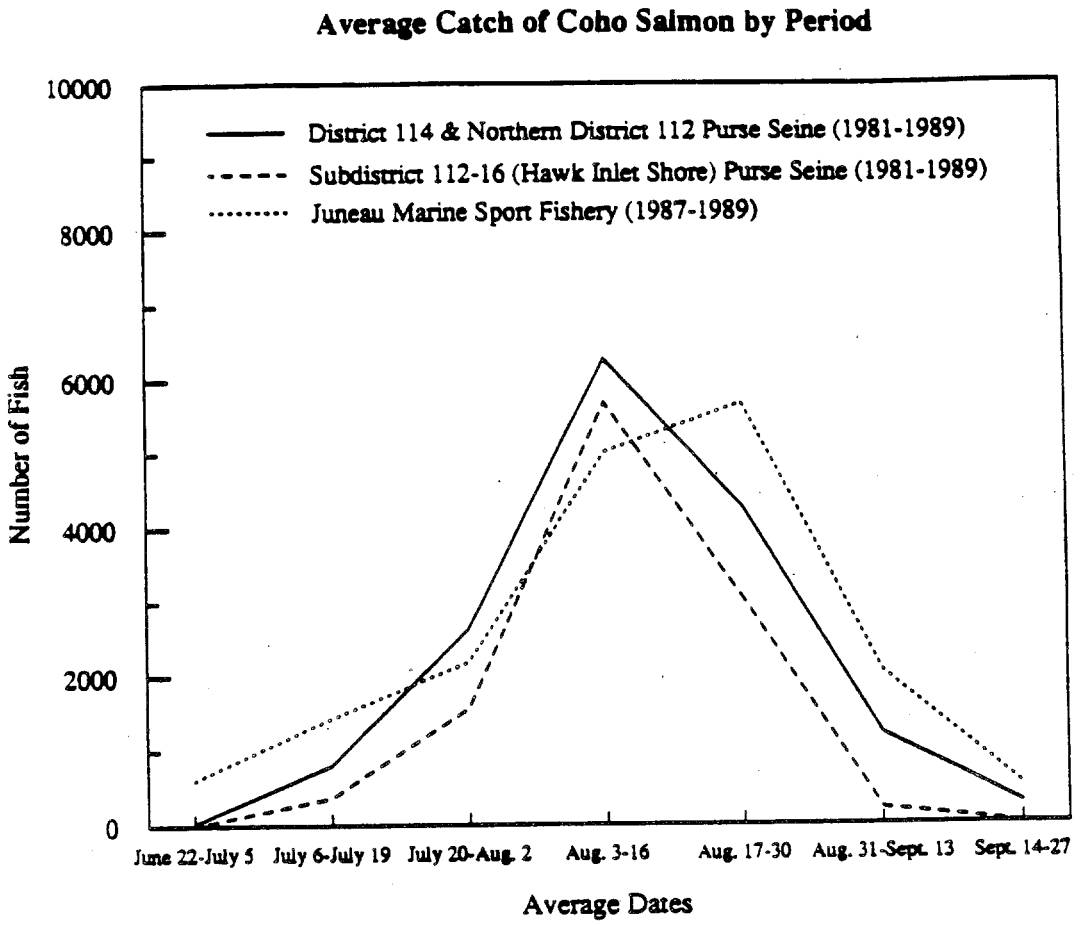
Although available data indicates that the percentage of fall coho stocks taken by purse seine fisheries has been low during most recent years, it does not provide a reliable indication of the direct impact of seine fisheries on the marine sport harvest of these stocks. This is because coded-wire tag estimates are based on total season fishery impacts on a stock, while the sport harvest is affected largely by the number of fish migrating through Juneau area waters during periods of peak sport effort in July and August, the period when most purse seine effort also occurs. The purse seine and marine sport catches largely overlap in timing and, therefore, come from approximately the same early segments of the migration.

Overall, fall stocks in the Lynn Canal and Stephens Passage areas have exhibited moderate to high levels of abundance in recent years. Therefore, any effect of the Hawk Inlet Shore purse seine fishery to the sport fishery probably results more from removal of fish destined to migrate through the sport fishery than from a general depletion of the stocks because of over-fishing.

The timing of the purse seine fishery along the Hawk Inlet shore indicates that it probably harvests early migrating Taku River coho salmon stocks that are important to the sport fishery, however, harvest rate estimates are unavailable. There is some indication that these early stocks have been reduced in recent years compared with fall stocks which returned at relatively high levels of abundance. The role of fishery exploitation and escapement trends in explaining the apparent decrease in early season coho salmon abundance is unknown.

Appendix C.1. Coho salmon catch in the purse seine fishery in District 114 and District 112 north of Pt. Hepburn and in the Juneau marine sport fishery, 1960-1989.

Year	Purse Seine: District 114 and Northern District 112	Purse Seine: Subdistrict 112-16 (Hawk Inlet Shore)	Juneau Sport Fishery
1960	32,469	2,494	1,075
1961	65,242	8,841	1,215
1962	37,429	1,647	1,233
1963	117,375	7,542	3,635
1964	137,644	20,202	3,059
1965	174,955	20,709	3,347
1966	112,631	6,216	1,752
1967	101,589	7,774	1,696
1968	153,598	19,972	10,271
1969	71,976	4,684	3,628
1970	106,568	39,134	6,554
1971	99,789	17,652	4,352
1972	119,297	28,973	8,992
1973	51,128	3,048	3,026
1974	10,876	3,632	7,148
1975	549	0	6,063
1976	1,504	0	9,317
1977	0	0	13,084
1978	0	0	16,677
1979	756	440	10,150
1980	3,351	1,410	1
1981	14,803	7,843	8,661
1982	36,189	25,806	20,747
1983	19,364	13,144	12,662
1984	17,077	12,624	10,100
1985	17,262	12,171	17,138
1986	3,911	3,359	9,763
1987	10,330	8,002	17,610
1988	3,369	1,222	12,016
Ave. (1960-1988)	52,449	9,605	8,161
Ave. (1960-1973)	98,692	13,492	3,845
Ave. (1974-1988)	9,289	5,977	12,189
1989 (Preliminary)	16,684	13,626	23,819



Appendix C.2. Average catch of coho salmon by period by the purse seine fishery in District 14 and District 112 north of Point Hepburn (1981-1989); the purse seine fishery along the Hawk Inlet shore (Subdistrict 112-16) only (1981-1989); and the Juneau marine sport fishery (1987-1989).

Appendix C.3. Estimated stock distributions (percent harvest by gear type and escapement) for three coho salmon stocks in the Juneau area, 1981-1988.

Year	Gear Type	Stock (Percent) Auke Lake	Speel Lake	Berners River
1981	Troll	29.8	38.1	-
	Purse Seine	0.2	3.6	-
	Drift Gill Net	3.2	3.0	-
	Sport	1.5	1.9	-
	Escapement	65.3	53.4	-
1982	Troll	20.1	33.8	41.6
	Purse Seine	17.5	33.7	0
	Drift Gill Net	3.2	4.2	34.1
	Sport	0.1	0	0
	Escapement	59.1	28.3	24.3
1983	Troll	32.6	41.8	50.4
	Purse Seine	0.8	5.5	0
	Drift Gill Net	2.4	1.7	20.5
	Sport	8.0	0.3	0.2
	Escapement	56.2	50.7	28.9
1984	Troll	32.3	-	-
	Purse Seine	0	-	-
	Drift Gill Net	7.4	-	-
	Sport	3.7	-	-
	Escapement	56.6	-	-
1985	Troll	35.1	-	44.8
	Purse Seine	0.2	-	0.8
	Drift Gill Net	4.2	-	28.9
	Sport	4.7	-	0
	Escapement	55.8	-	25.5

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Appendix C.3. (page 2 of 2.)

Year	Gear Type	Stock (Percent) Auke Lake	Speel Lake	Berners River
1986	Troll	43.0	-	55.1
	Purse Seine	0	-	0
	Drift Gill Net	6.2	-	36.2
	Sport	3.9	-	1.6
	Escapement	46.9	-	7.1
1987	Troll	37.2	-	53.0
	Purse Seine	0	-	0
	Drift Gill Net	4.0	-	23.5
	Sport	2.0	-	0.3
	Escapement	56.8	-	23.2
1988	Troll	25.4	-	39.6
	Purse Seine	0.7	-	1.2
	Drift Gill Net	6.0	-	41.0
	Sport	4.4	-	0
	Escapement	63.5	-	18.2
Average	Troll	32.0	37.9	47.4
	Purse Seine	2.4	14.3	0.3
	Drift Gill Net	4.6	3.0	30.7
	Sport	3.5	0.7	0.4
	Escapement	57.5	44.1	21.2

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